

CHAPTER 17. LAND MOBILE AND OTHER FM COMMUNICATIONS SYSTEMS FREQUENCY ENGINEERING

1700. GENERAL. This chapter will present guidance and criteria for engineering frequencies for FAA land mobile and other FM communications systems operating in the Federal Government fixed/mobile bands.

1701. FREQUENCY ENGINEERING. The FAA currently uses the bands 162-174 MHz and 406.1-420 MHz for land communications.

a. While no formal criteria for cochannel and adjacent channel separation exist within FAA, a rule of thumb for voice communications is to separate cochannel assignments by 100 nmi or RLOS, where possible. For data links, use the same rule unless unique digital coding is available, such as in the Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR). In this case, close separation (down to 5 nmi) has been found to work satisfactorily.

b. Even though no first adjacent channel (25 kHz) protection standard is provided for fixed/land mobile communications systems, 1 nmi separation should be provided as a safety margin, unless additional filters or multicouplers are used. For a description of how to perform a detailed engineering analysis, refer to NTIA Manual, annex I.

1702. SYSTEMS BASICS. FAA FM radio communications systems operating in the land mobile bands are of two major types: repeater/base/portable/mobile voice systems, and voice/data links.

a. The repeater/base/portable/mobile systems are voice systems used in support of the RCOM.

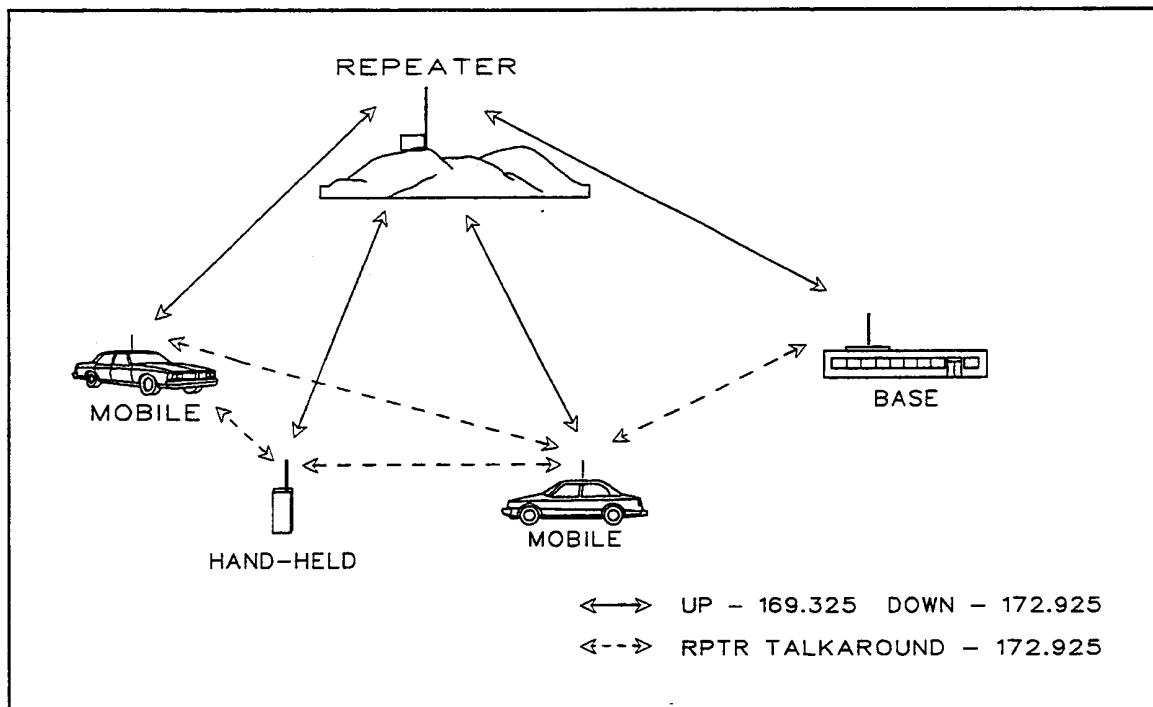
b. The voice/data links are used for LLWAS, MALSR's, Remote Maintenance Monitoring (RMM), Automated Weather Observing System (AWOS) and other systems that require low capacity fixed RF links.

1703. RCOM. The RCOM VHF FM COMM frequency plan is as shown in figure 17-1.

FIGURE 17-1. RCOM COMM FREQUENCY PLAN

Channel	Repeater Uplink (MHz)	Repeater Downlink (MHz)
1	169.325	172.925
2	169.350	172.950
3	169.375	172.975
4	169.250	172.850
5	169.275	172.875
6	169.300	172.900
7	169.225	172.825
8	172.125	simplex for FS
9	172.150	simplex for Air Security
10	172.175	simplex for AF Mntnce
11	166.175	simplex (US & P)

a. **The RCOM VHF FM is a three-way voice system.** It can be used either through a repeater (duplex) or unit-to-unit (simplex). See figure 17-2.

FIGURE 17-2. EXAMPLE OF A REPEATER/BASE/PORTABLE/MOBILE FM SYSTEM

b. **Using the repeater**, any base, mobile, portable or hand-held unit can talk to any other unit within RLOS range of the repeater by utilizing duplex operation. This consists of transmitting on one frequency (uplink) which is automatically repeated and translated to another frequency. This second frequency (downlink) is then transmitted by the repeater and received by the intended unit and all others tuned to the same frequency and PL.

c. Bypassing the repeater allows unit to unit direct communications without energizing the repeater which would restrict repeater use for other long range communications. Simplex operation is where both units within RLOS transmit and receive on the single frequency, in this case the repeater output frequency (downlink). This permits short range communications without activating the repeater while permitting reception of the repeater at any time the units are not engaged in simplex communications (standby).

d. Tone activated squelch (PL). The PL acronym comes from the trade name of the first tone-activated squelch system (Motorola's Private Line). PL's are transmitted single tones between 67.0-254.1 Hz (42 total), but they are normally not heard in a commercial FM land mobile system due to the 300-3000 Hz system voice band pass filters built into the equipment. This is intentional, to permit use of control tones without interfering with the voice communications on the same units. They are continuously transmitted when the transmitter is keyed. Upon reception, the tones will open a matching PL squelched receiver, if PL is activated. If PL is activated on a receiver, only stations transmitting the same PL can be heard. The normal PL for RCOM is 136.5 Hz. In a few areas, a second PL may be used.

e. Dual tone multiple frequency (DTMF). DTMF's are tones used to control various functions of RCOM. The tones are selected by a keypad attached to the transmitter or microphone. Some of the controlled functions are to:

(1). **Activate a radio control link** of the RCOM to tie in another repeater further down the line.

(2). **Access a telephone line** through a phone patch at a repeater site.

(3). **Access the HF radio system** through a repeater to permit long range communications from a mobile or portable station.

1704. RF VOICE/DATA LINK SYSTEMS.

a. LLWAS radio links are used to relay wind speed/direction information from field sensors to a central processor. LLWAS frequency requirements are satisfied within either the 162-174 or 406.1-420.0 MHz bands. After 2000, due to equipment upgrades, all LLWAS requirements will be satisfied within the 932-935/941-944 MHz bands. Until 2000, frequencies for existing LLWAS equipment shall be selected from those listed in Figure 17-3.

FIGURE 17-3. LLWAS FREQUENCIES

162.250	409.175	932.5125	941.5125
162.275	410.300	932.5625	941.5625
162.300	413.600	932.5875	941.5875
162.325	416.025	932.6125	941.6125
162.350	419.025		

b. MALSR radio links are used to control approach lighting from the ATCT where it is not practical to use land lines. The frequency 165.7625 MHz shall be the primary channel for MALSR.

c. RMM radio links are used to relay maintenance and control data from a remote site back to a central monitoring point. Frequencies shall be selected from the following: 408.825, 410.250, 410.300, 413.600, 416.875, 419.025 MHz. If these specific frequencies are not available, system frequencies should be engineered in accordance with NTIA Manual supplement for the 406.1 - 420.0 MHz band.

d. AWOS radio links are used to relay weather information from field sensors to a central processor.

1705. MISCELLANEOUS RADIO LINKS. Low capacity RF links may be operated in the band 406.1-420.0 MHz on a case-by-case basis.

1706. thru 1799. RESERVED.